Project 2

$$\int_0^x 1 \cdot \log_2(n)\, dn$$

$y = \log_2 x$

$2^y = x$

$y \ln 2 = \ln x$

$\frac{dy}{dx} \ln 2 = 1/x$

$u = \log_2 n \qquad u^I = 1/n \ln 2$

$v^I = 1 \qquad v = n$

$$n\log_2 n - \int_0^x \frac{1}{n \ln 2} \cdot n\, dn =$$

$$n\log_2 n - 1/\ln 2 \int_0^x 1\, dn = n\log_2 n - 1/\ln 2\,(n)\Big|_0^x$$

$x\log_2 x - x/\ln 2$

$$\int_0^{x-1} 1 \cdot \log_2(n+1)\, dn$$

$y = \log_2(x+1)$

$2^y = x+1$

$y \ln 2 = \ln(x+1)$

$\frac{dy}{dx} \ln 2 = 1/x+1$

$u = \log_2(n+1) \qquad u^I = 1/\ln 2(n+1)$

$v^I = 1 \qquad v = n$

$$n\log_2(n+1) - \int_0^{x-1} \frac{1}{(n+1)\ln 2} \cdot n\, dn =$$

$$n\log_2(n+1) - \int_0^{x-1} \frac{n\, dn}{n\ln 2 + \ln 2} \cdots$$

$$\int_1^x \frac{1}{n}\,dn = \ln(n)\Big|_1^x$$

$$\ln(x) - \ln(1)$$

$$\int_1^{x-1} \frac{1}{n+1}\,dn = \int_1^{x-1} \frac{1}{u}\,du = \ln(u) = \ln(n+1)\Big|_0^{x-1}$$

$$\ln(x-1+1) - \ln(0+1)$$

$$\ln(x) - \ln(1)$$

$u = n+1$

$du = 1\,dn$